Dry Pea Production in Saskatchewan

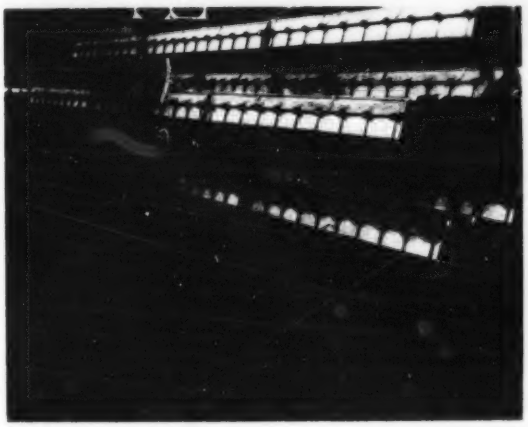
FarmFacts

Produced by Saskatchewan Agriculture and Food and Saskatchewan Rural Development

The pea was among the first crops cultivated by man and was first domesticated in the Near East. It is a cool season crop and is widely grown in the cooler temperate zones of the world. The dry pea is grown on about 9 million ha annually and total production exceeds 10 million t. China and Russia each produce about one-third of the world dry pea crop.

The pea was a leading crop in Canada at the turn of the century, with Ontario averaging 288,000 ha for the 20-year period, 1883-1902. However, by 1980 only 50,000 ha of the dry pea were grown in Canada, primarily in the 3 prairie provinces, where the average yield was about 1,800 kg/ha (1,600 lb/ac).

The dry pea was grown on over 150,000 ha in Saskatchewan in 1987, a large increase from the 300 ha reported in 1967. The average yield in Saskatchewan is about 1,800 kg/ha. However, higher yields may be obtained if proper agronomic practices are followed.



Pickup reel, with fingers and vine lifters. This assembly can be adapted to either combine or swather.

Market Opportunities

World exports of the dry edible pea have averaged about 300,000 t annually in recent years (excluding the Communist Bloc countries, for which information is not readily available). Approximately one-half of these exports were from North America. Canada's share of the export trade has been variable, but has averaged about 25 percent. Major importers have been Cuba, Trinidad, Venezuela, and the United Kingdom. A large market in the European Economic Community has developed in 1986 and 1987 for "feed" peas used as livestock protein supplement. The size of this market in succeeding years will be somewhat smaller, but still important.

The dry pea is widely used for human food and livestock feed. Only a small part of Canada's dry pea crop is used domestically for human food such as pea soup. The balance is exported or used for livestock feed or seed. Research by the Animal and Poultry Science Department, University of Saskatchewan, has shown that a ground pea-barley mixture (40 percent peas with a 22.5 percent protein content) with iodized salt and a mineral-vitamin premix resulted in a 16 percent protein grower-finisher ration suitable for hogs. However, few commercial feed processors are using appreciable quantities of pea seeds in feed mixes, since alternative sources of protein often have an economic advantage. Until this changes, pea production for hogs may be limited to hog producers who want to produce their own protein by growing a pea crop, thereby using some of their land to avoid a cash outlay for protein.

A relatively high proportion of the pea crop (10 to 12 percent) is required for seed. This is due to the high seeding rate required to produce a satisfactory stand of this large-seeded crop.

Research by the Plant Biotechnology Institute of the National Research Council has resulted in the development of a process for milling dry pea seeds into hulls, flour, pea protein concentrate, and pea starch. A continuing research program at the University of Saskatchewan involves development of new uses for these pea products. Some of the more promising uses developed for pea starch are in the purification of potash and in the manufacture of carbonless carbon paper. However, commercialization is dependent upon the economics of hull, starch and protein sales versus processing costs.

The farmer is advised to obtain a contract for marketing his pea crop, unless the crop is for his own seed or feed production. Several firms offer contracts, generally specifying a minimum quaranteed price. Most firms will supply seed on credit, if desired.

Adaptation

The pea is a cool season crop with a restricted root system and cannot tolerate hot weather or drought stress during flowering. Accordingly, it is best adapted to the Black soil zone. Poorly drained, cold soils should be avoided, as they favor the development of seedling diseases and root rots. The pea crop should not be grown on salt-affected soils. Well-drained, clay loam soils are ideal for pea production.

The pea crop should not be grown on the same field more than once every 4 to 5 years because of the danger of a rapid increase in soil-borne diseases.

The pea plant is capable of fixing part of its nitrogen requirement if properly inoculated with the pea, lentil and vetch strain of *Rhizobium* (see "Inoculation"). Thus, acceptable pea yields can be produced with little nitrogen fertilizer. In addition, crops following the pea crop in the rotation generally yield higher than crops grown after cereals, flax, or canola. For these reasons, pea production provides an agronomically sound way of extending and improving crop rotations in the Black soil zone.

Seedbed Preparation and Seeding

Firm, weed-free seedbeds on high-fertility soils are best for pea production. Stony fields should be avoided or packed after seeding to bury loose stones that otherwise might be picked up in swathing and harvesting. Cultivate the land to seeding depth prior to seeding, as this helps warm the soil and favors rapid germination.

Plant the pea seeds 3 to 8 cm deep in rows 15 cm apart as early in the spring as feasible, provided the temperature of the surface 3 cm of soil is above 5°C and the soil is not excessively wet. Early seeding advances maturity of the crop, so that the probability of detrimental high temperatures during flowering is reduced. Pea seedlings can withstand considerable frost. Even if the frost is severe enough to kill the main shoot, the pea plant will initiate regrowth from buds at one of the nodes at or below the soil surface, with a resulting delay in maturity. Early seeding, in general, results in higher yields, but protein content may be slightly lower.

Seeding is done with an ordinary grain drill, but the discer is perfectly satisfactory. If the discer is used, the soil should be packed after seeding to prevent excess moisture loss from the loose soil. Care must be taken to adjust the seeder to prevent cracking of the seed, especially of the large-seeded varieties, since cracked seed will not germinate.

Seeding rate depends on seed size of the variety. The optimim seeding rate is about 12 seeds per m of row in rows 15 cm apart. This averages about 125 kg/ha (110 lb/ac) for small-seeded varieties such as Trapper, 175 kg/ha (155 lb/ac) for Tara and Victoria and 190 kg/ha (170 ib/ac) for large-seeded varieties such as Century.

Some farmers seed barley, oat, mustard, or canola at reduced rates in their pea crop to reduce lodging and facilitate swathing. However, pea plants are poor competitors and yield of the pea component will be reduced. Considerable testing of companion planting is underway. Progress Reports are available from Agriculture Development Fund.

Varieties

Several registered dry pea varieties are adapted to Saskatchewan. Most have yellow cotyledons and smooth seeds.

Century (formerly Creamette) — Licensed in 1960: Seeds are much larger than Trapper, and about the same yield and maturity.

Trapper — Registered in 1970: A small-seeded variety which has replaced Chancellor, a variety commonly used in the past. Compared with Chancellor, Trapper is similar in agronomic characteristics, but higher in yield. Trapper matures in 95 to 100 days. Trapper has the advantage of smaller seeds (reduced cost of establishment) and less vine growth (reduced problems with vines and foliage diseases) than Century.

Tara — Registered in 1978: Seeds are intermediate in size between Century and Trapper. The seeds are compressed together in the pod, resulting in flattened sides on about half the seeds. Because of these irregularly-shaped seeds, Tara is often discounted in the market place. However, Tara is powdery mildew resistant and outyields Century and Trapper by at least 15 percent.

Victoria — Registered in 1984: Seeds are intermediate in size between Century and Trapper. Victoria matures several days earlier than Trapper, but has shorter vines and is higher yielding.

Tipu — Registered in 1985: The first semi-leafless pea variety registered in Canada. Basically, a semi-leafless Century. Reduced foliage eases threshing and may reduce severity of foliage diseases.

Titan — Registered in 1985: Possible replacement for Century, about 10% higher yielding than Century.

Fortune — Registered in 1985: Late maturing, high yielding and medium seed size.

Bellevue — Registered in 1986: Extremely late maturing, not adapted to northern half of the Black soil zone. High yielding, shortened internodes, tough seedcoat and medium seed size.

Express — Registered in 1986: Early, high yielding, medium seed size and shortened internodes.

Princess, Radley, Miranda, Sirius, Stegholt and **Whero** are newly registered. See Varieties of Grain Crops for Saskatchewan.

Weed Control Practices

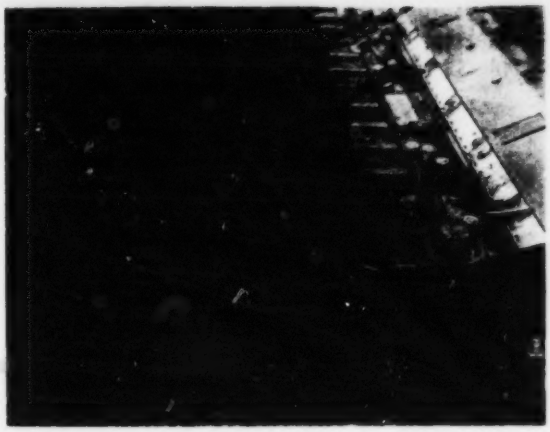
Weeds compete severely with field pea, particularly at the time of crop emergence, resulting in sharply reduced seed yield and lower quality. Costs associated with cleaning and transporting dockage decrease prices paid to the producer. Therefore, an effective weed control program is essential and often the most important consideration for profitable field pea production. An integrated approach to weed control combines preventative and cultural measures (such as clean seed and appropriate tillage) with effective use of selection chemicals. Weed control during summerfallow years (particularly for perennials), fall spraying for winter annuals and selection of a field where anticipated weed problems can be controlled by products registered for use in field pea are important points to note when planning field pea production. No new weeds should be

introduced with the seed, and effective weed control must be obtained during the cropping season so that the pea stubble land will remain suitable for subsequent cropping. Avoid areas where volunteer cereal and perennial grass growth may be a problem.

A. Cultural Weed Control — Harrowing between seeding and emergence of the pea crop results in destruction of newly emerged weed seedlings and removal of weeds which escaped previous tillage operations. Harrowing should be avoided as the field pea plants emerge and for several days after emergence to permit effective rooting and stand establishment. Postemergence harrowing must be viewed as a **drastic** measure. However, once the field pea plants have reached the 4- to 6-leaf stage an additional operation, preferably using a finger weeder or flexible harrow, may provide a limited degree of control of germinating annual broadleaf weeds. The grower should be aware that weed control from postemergence harrowing is often erratic, and crop damage may cause variable maturity. The best weed control will be obtained by harrowing on a dry, warm, sunny day. Harrowing should be avoided during damp, cool weather or during a heavy dew to prevent the spread of diseases. Harrowing may also be required to break crusted surfaces in clay soils.

B. Chemical Weed Control — Chemical weed control usually provides effective and consistent results. The advantages from fall application of soil-incorporated herbicides include more uniform distribution of the active materials for improved weed control and crop tolerance, conservation of soil moisture by reduction of spring tillage operations, the potential for earlier seeding, and more efficient timing of labor inputs for herbicide application and incorporation. The primary disadvantage of fall application of soil-incorporated herbicides is increased susceptibility of the treated fields to soil erosion due to reduction of crop residues and loosening of the soil surface. Granular formulations are recommended for fall application into stubble, as liquid formulations may be bound by the crop residues, resulting in reduced weed control.

For postemergence products, operations with a field sprayer should be conducted before the pea vines reach the 5-node stage to minimize mechanical damage. In addition, weeds are generally more susceptible and field pea plants more tolerant to herbicides applied at an early growth stage.



Spring-loaded vine lifters

Careful planning of rotations will permit a balanced attack on the weeds. The different products available for use in pea and cereal crops can complement each other, thereby controlling a wide spectrum of weeds and ensuring that no weed species goes unchecked for more than a single season. Fields treated with the commercial mixture of picloram plus 2,4-D (TORDON 202C) should **NOT** be seeded to grain legumes for at least 5 years after applicaton of picloram. Carryover of picloram may necessitate seeding an indicator area with pea seeds 1 year prior to intended commercial cropping as a test for residual activity. Symptoms of picloram injury include an upward cupping of the leaves, reduced growth and failure of the plants to pod and set seed.

Problems of pulse crop phytotoxicity have also resulted when areas previously treated with GLEAN, ALLY or ASSERT were seeded with pea seeds. Follow label re-cropping restrictions when growing field pea after use of any of these products. Areas of dense perennial weed growth should be avoided or controlled with spot treatments of non-selective herbicides such as glyphosate (ROUND-UP) where the crop is sacrificed to control patches of thistle or quackgrass. A height differential between pea seedlings and taller weeds permits selective application of herbicides through a rope wick applicator. Fall application of a phenoxy will control winter annual weeds.

Several herbicides are registered for use in field pea crops which effectively control most of the common weed species. Frequently, a combination of herbicides will be required to provide the desired control of both grass and broadleaf weeds during the cropping season. Precautions should always be taken to carefully read and exactly follow the label recommendations for each herbicide, as these may differ from the more familiar applications in cereals and oilseeds.

The following herbicides are presently registered for use in field pea crops in Saskatchewan.

Avadex
Basagran
Edge
Excel
Hoe-Grass
MCPA
MCPB with MCPA
Metribuzin
Poast
TCA
Trifluralin

Use of non-registered compounds is not advised since the responsibility falls completely upon the grower in the event of crop damage, inadequate weed control or illegal chemical residues in the crop.

Potential field pea producers may obtain information on the current status of herbicide recommendations and weed control procedures by contacting the Crop Development Centre, University of Saskatchewan, Saskatoon, staff of Saskatchewan Agriculture and Food or by reviewing the annual publication "Chemical Weed Control in Cereal, Oilseed, Pulse and Forage Crops."

C. Crop Desiccation: Desiccation may be used on dry green peas to reduce bleaching of desirable green colour. Desiccation of yellow or green pea may

also reduce the period of time from maturity to harvest and eliminate the need for swathing to dry green weeds which interfere with harvesting. Spray when the crop has reached maturity, as this treatment does not mature the pea seed. In light stands or fields free from weeds, apply diquat (REGLONE) at 0.9 L/ac in a minimum of 8 L/ac water using a fixed-wing aircraft fitted to apply uniform spray coverage. In heavy strands or fields which contain weeds, apply diquat at 1.1 L/ac in a minimum of 18 L/ac water. Always add AGRAL 90 (a wetting and spreading agent) at 0.1% of total spray volume to provide more uniform coverage and complete desiccation. Avoid spray drift onto adjacent crops and tree rows. Germination of seed is not affected. Commence combining when the pea seeds test 20% moisture. Mechanically dry seeds to 16% (see Harvesting).

CAUTION — Always read and follow label instructions when using herbicides and desiccants

Insect Pests

Pea aphid — The adult is small — about 4 mm (3/16 in.) long — light-green and long-legged. The insect may be wingless or have prominent, nearly transparent wings. The aphid overwinters as an egg attached to the stems or leaves of alfalfa or clover. In early spring the eggs hatch. The young aphids feed on the newly emerged alfalfa or clover plants. During May and June, depending on weather and host plant conditions, the insects develop wings and fly, with the aid of wind currents, to the pea fields. The pea aphid weakens the plant directly by sucking its sap. The pea aphid also transmits virus diseases from one pea plant to another. It is difficult to determine whether the crop should be sprayed for aphids. A heavy shower or strong wind will often cause the insects to disappear. An insecticide application may be indicated if there are more than 10 aphids on a plant during the period between formation of the 10th node and appearance of the first flower. One application per season, if required, should give satisfactory control.

Disease Prevention

Field pea plants are subject to numerous diseases. Such diseases can seriously reduce yield and quality of the crop. They are carried mainly in the seed or in the soil. To avoid serious disease build-up, the following precautionary measures should be taken:

1. Seed early.
2. Plant pedigreed seed. To reduce problems with Ascochyta blight use seed that has tested Ascochyta-free.
3. Rotate crops. Pea production on pea stubble will increase soil-born diseases, Ascochyta and powdery mildew, so practice crop rotation.

Common Diseases

Ascochyta blight — Ascochyta diseases of the pea are caused by 3 closely related fungi that produce distinct symptoms characterized by spots on the leaves, stems and pods. These spots vary in color from brown to purple, depending on the fungus causing the disease. Seedborne infection is probably the principal source, but the fungi also overwinter in infected plant debris.

The severity of the disease can be reduced by using clean seed, seed treatment, locating new seedings as far away as possible from previous years' fields, and not growing a pea crop in a field more frequently than once every 4 or 5 years. Registered varieties have some tolerance but are not resistant to *Ascochyta pinodes*, the most prevalent species in Saskatchewan.

Sclerontinia stem rot — This disease attacks many broadleaf crops, but is most severe on sunflower and rapeseed/canola. It overwinters as sclerotia which germinate and produce spores which infect the fallen petals on the soil surface. As soon as the pea stems lodge and come in contact with these infected petals, sclerotinia stem rot may occur. Infection is most severe if free moisture is present on the lodged pea stems for prolonged periods of time. No fungicide treatment is registered. Pea producers are encouraged to avoid using a broadleaf crop in rotation more often than once in every 4 years.

Root rot — Root rot may occur on all of the underground parts of the pea plant and even on the stem a short distance above the surface of the soil. When young seedlings are infected with root rot, they usually die. Foliage symptoms are not noticeable in the early stages, but as the disease progresses an infected plant may appear yellow and stunted. Seed treatment offers some control by protecting seeds and seedlings during their early growth. Crop rotation prevents an extensive buildcup of organisms causing root rot. Low-lying areas favor the development of root rot; therefore, a well-drained location is desirable for peas.

Bacterial blight — The symptoms may appear on any of the above-ground parts of infected plants. Infections start as small, water-soaked spots on the leaves, stems, and pods. The spots on the leaves are circular and those on the pods are elongated. A slimy, creamy-white exudate may appear on the surface of the spot. When this exudate dries the spot turns olive-brown and feels papery. The disease is mostly seed-borne; therefore, only seed from fields free of the disease should be used. However, the bacteria can overwinter on crop debris and thus crop sanitation and crop rotation are desirable practices. The bacteria are spread by splashing rain; cool, moist weather also favors rapid spread of the disease.

Powdery mildrew — This disease is caused by a fungus. It becomes important under prolonged warm, dry daytime conditions when nights are cool enough to cause dew formation, and is widespread wherever peas are grown. White, powdery areas appear on leaves, stems, and pods, and may cover the entire plant. Brown, pitted spots may occur during severe epidemics, but infected plants rarely die. Sulfur may be effective if applied at the first sign of the disease and every 10 days thereafter, but it is hardly worth the expense and trouble. The best control is to rotate crops and to seed early, since powdery mildew is most serious on late-maturing pea crops. The variety Tara is resistant.

Other fungus diseases of the pea crop are downy mildew, anthracnose, septoria blight, and rust. Some virus diseases such as pea mosaic, pea streak, and pea stunt also occur. Good seed, seed treatment and crop rotation will help retard the development of these and new diseases that may appear in the future.

Harvesting

Extreme care should be taken in harvesting the field crop. Pea seeds that have been harvested in a careless manner and contain excessive amounts of foreign material, cracked seed coats, and broken and damaged seeds will have heavy losses in the cleaning process.

Field pea plants may be swathed or straight-combined. If swathed just prior to full maturity, before vines and pods are dry, a light roller can be used behind the swather to protect the swath from wind damage. The swather can

also be used if cutting is delayed until the crop has reached full maturity. The combine should follow immediately behind the swather; danger of swath damage by strong winds in a mature crop will thereby by avoided. The swather should be equipped with vine lifters (pic-up guards) and possibly a pick-up reel (see illustrations). The half-moon vine lifters are the least expensive and most successful.

When the pea crop is straight-combined, the following method is used. The vines are permitted to ripen on the ground; after reaching full maturity they can be successfully harvested, provided the combine is equipped with a floating cutter bar, a pick-up reel, and vine lifters are attached to the sickle guards.

Since the pea seeds shell very easily when dry, they should be harvested during the humid part of the day, and action of the reels against the crop should be kept to a minimum. Very low cylinder speeds are required to reduce seed splitting. Cylinder speeds of 350 to 600 r.p.m. are normally used, depending on cylinder diameter and the moisture content of the peas. An initial concave setting of 1½ cm clearance at the front and ½ cm at the rear is recommended. Combine augers and grain loaders should be operated at low speeds to reduce cracked, split, and broken seeds.

Pea seeds containing green weed seeds or other foreign materials high in moisture content should be cleaned as soon as possible to prevent heating. The pea crop can be combined at 16 to 20 percent moisture to keep splitting and shattering losses low and then air dried for storage. Moisture levels up to 16 percent are considered safe for the field pea. If drying is necessary a maximum air temperature of 43°C should be used for pea seed harvested for seed purposes and 71°C for pea seed harvested for commercial use.

ADDITIONAL INFORMATION SOURCES

Legume Inoculation
Saskatchewan Agriculture and Food (fact-sheet)

Chemical Weed Control in Cereal, Oilseed, Pulse and Forage Crops
Saskatchewan Agriculture and Food (annual)

General Recommendations for Fertilization in Saskatchewan
Saskatchewan Agriculture and Food (bi-annual)

Pea Varieties for Saskatchewan
Saskatchewan Agriculture and Food and Saskatchewan Rural Development (fact-sheet)

Varieties of Grain Crops for Saskatchewan; Agriculture Development Fund

A. E. Slinkard
Crop Development Centre
and
F. A. Holm
Department of Crop Science and Plant Ecology
University of Saskatchewan

5M 02/90 ISSN 0840-9447